Pacific Gas and Electric Company®

James R. Becker
Site Vice President

Diablo Canyon Power Plant
Mail Code 104/5/601
P. O. Box 56
Avila Beach, CA 93424

805.545.3462
Internal: 691.3462
Fax: 805.545.6445

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PG&E Letter DCL-11-018

10 CFR 50.90

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Diablo Canyon Units 1 and 2
Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
License Amendment Request 11-02
Revision to Technical Specification 3.7.1, "Main Steam Safety Valves (MSSVs)"

Dear Commissioners and Staff:

Pursuant to 10 CFR 50.90, Pacific Gas and Electric Company (PG&E) hereby requests approval of the enclosed proposed amendment to Facility Operating Licenses DPR-80 and DPR-82 for Units 1 and 2 of the Diablo Canyon Power Plant (DCPP), respectively. The enclosed License Amendment Request (LAR) proposes to revise Technical Specification (TS) 3.7.1, "Main Steam Safety Valves (MSSVs)," Table 3.7.1-1, "Maximum Allowable Power Range Neutron Flux High Setpoint With Inoperable MSSVs," and the TS Bases for the MSSVs.

This LAR removes a one-time note listed in TS Table 3.7.1-1, specific to Unit 2 Cycle 15, that is no longer applicable or needed. This LAR also revises the TS Bases B 3.7.1 to reflect a new analysis methodology for establishing the reduced Power Range (PR) neutron flux high setpoint for one inoperable MSSV as listed in Table 3.7.1-1. There is no proposed change to the PR neutron flux high setpoint; the value of 87 percent Rated Thermal Power (RTP) listed in TS Table 3.7.1-1 for one inoperable MSSV will remain.

PG&E has determined that this LAR does not involve a significant hazard consideration as determined per 10 CFR 50.92. Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment needs to be prepared in connection with the issuance of this amendment.

PG&E requests approval of this LAR no later than February 17, 2012. PG&E requests the license amendment(s) be made effective upon NRC issuance, to be implemented within 90 days from the date of issuance.

PG&E makes no regulatory commitments (as defined by NEI 99-04) in this letter. This letter includes no revisions to existing regulatory commitments.

The Plant Staff Review Committee reviewed these proposed amendments and the Station Director approved them. A copy of this proposed amendment is sent to the California Department of Public Health, pursuant to 10 CFR 50.91.

If you have any questions or require additional information, please contact Tom Baldwin at 805-545-4720.

I state under penalty of perjury that the foregoing is true and correct.

Executed on February 17, 2011.

Sincerely,

James R. Becker
Site Vice President

ssz/4040
Enclosure
cc: Diablo Distribution
cc/enc: Gary W. Butner, Branch Chief, California Department of Public Health
Elmo E. Collins, NRC Regional Administrator, Region IV
Michael S. Peck, NRC, Senior Resident Inspector
Alan B. Wang, NRC Project Manager, Office of Nuclear Reactor Regulation

Enclosure

Evaluation of the Proposed Change

Attachments

1. Technical Specification Page Markups
2. Retyped Technical Specification Pages
3. Technical Specification Bases Page Markups (for information only)

Evaluation of the Proposed Change

License Amendment Request 11-01
Revision to Technical Specification 3.7.1, "Main Steam Safety Valves (MSSVs)"

EVALUATION

1. SUMMARY DESCRIPTION

This letter is a request to amend Operating Licenses DPR-80 and DPR-82 for Units 1 and 2 of the Diablo Canyon Power Plant (DCPP), respectively.

This License Amendment Request (LAR) removes a one time note listed in Technical Specifications (TS) Table 3.7.1-1 specific to Unit 2 Cycle 15 that is no longer applicable or needed. This LAR also revises the TS Bases B 3.7.1 to reflect a new analysis methodology for establishing the reduced power range (PR) neutron flux high setpoint for one inoperable main steam safety valve (MSSV) as listed in TS Table 3.7.1-1. No changes to the PR neutron flux high setpoint are proposed; the value of 87 percent Rated Thermal Power (RTP) listed in TS Table 3.7.1-1 for one inoperable MSSV will remain.

2. DETAILED DESCRIPTION

Proposed Amendment

This LAR proposes two separate changes to TS 3.7.1, "Main Steam Safety Valves:"

TS Table 3.7.1-1, "Maximum Allowable Power Range Neutron Flux High Setpoint With Inoperable MSSVs" for the Unit 2 Facility Operating License DPR-82 would be changed to eliminate a one time note approved in exigent License Amendment 208 (Ref. 6). The note in TS Table 3.7.1-1 was applicable only to Unit 2 Cycle 15 and allowed resetting the PR neutron flux high setpoint to 106 percent RTP when MSSV MS-2-RV-224 was inoperable.

The second proposed TS change applicable to both Unit 1 and Unit 2 (Facility Operating Licenses DPR-80 and DPR-82, respectively) would revise the TS Bases to reflect a new analysis methodology. The new methodology demonstrates the acceptability of the existing PR neutron flux high setpoint value of 87 percent RTP for one inoperable MSSV as listed in TS Table 3.7.1-1.

A mark-up of proposed TS changes is in Attachment 1. Retyped TS changes are in Attachment 2. A mark-up of TS Bases changes are included for information only in Attachment 3.

System Description

The primary purpose of the MSSVs is to provide overpressure protection for the secondary system. The MSSVs also provide protection against overpressurizing the reactor coolant pressure boundary by providing a heat sink for the removal of energy from the reactor coolant system (RCS) if the preferred heat sink, provided by the condenser and circulating water system, is not available.

Five MSSVs are located on each of the four main steam headers, outside containment, upstream of the main steam isolation valves (MSIVs), as described in the Final Safety Analysis Report Update (FSARU). The MSSVs must have sufficient capacity to limit the secondary system pressure to less than or equal to 110 percent of the steam generator (SG) design pressure. The MSSV design includes staggered setpoints, according to TS 3.7.1, Table 3.7.1-2, so that only the needed valves will actuate. Staggered setpoints reduce the potential for valve chattering that is due to steam pressure insufficient to fully open all valves during an overpressure event.

The accident analyses require all five MSSVs per SG be operable to provide overpressure protection for design basis transients.

With a reduced number of operable MSSVs, TS 3.7.1, Action A.1 allows the plant to operate at a reduced power level with a reduced Power Range Neutron Flux High setpoint as determined by the TS Table 3.7.1-1. This reduction in the allowed power level is dependent upon the number of inoperable MSSVs, and is based on the reduced heat removal capability.

<u>Background</u>

In 1997, PG&E submitted LAR 97-06 in DCL-97-105 (Reference 2) to revise TS 3.7.1.1, Table 3.7-1 (note that the numbers of the relevant TS and Table have changed over time) and the associated bases for the reduced power operation levels for inoperable MSSVs in response to NRC Information Notice 94-60 (Reference 1) and the associated Westinghouse Nuclear Safety Advisory Letter (NSAL) 94-001, "Operation at Reduced Power Levels with Inoperable MSSVs." (Reference 3). NSAL 94-001 identified that the previously assumed linearity between MSSV relief capacity and operating power level for establishing reduced PR high flux trip setpoints associated with inoperable MSSVs was incorrect. It was determined that under certain conditions with typical safety analysis assumptions, a Loss Of Load / Turbine Trip (LOL/TT) transient from partial load conditions could result in overpressurization of the main steam system when operating in accordance with the existing TS 3.7.1 reduced PR high flux trip setpoints.

PG&E concluded that NSAL 94-001 was applicable to DCPP Units 1 and 2, and the existing TS 3.7.1 reduced PR high flux trip setpoints for one, two, and three inoperable MSSVs of 87 percent, 64 percent, and 42 percent RTP may not be conservative with respect to the revised calculation methodology in the NSAL.

In LAR 97-06, PG&E revised the reduced PR high flux trip setpoints associated with 2 and 3 inoperable MSSVs to values of 47 percent and 29 percent RTP, respectively, based explicitly on the NSAL 94-001 calculation methodology. However, PG&E performed a RETRAN-02 analysis of the LOL/TT event with one inoperable MSSV to establish that the existing PR high flux trip setpoint of 87 percent listed in TS Table 3.7.1-1 was still conservatively bounding.

PG&E calculation N-114 (Reference 9) documented a RETRAN-02 LOL/TT analysis based on the FSARU bounding assumptions of 102 percent RTP, a +5 pcm/°F Moderator Temperature Coefficient (MTC), 3 percent accumulation, and a +3 percent MSSV lift setpoint drift. Also, the calculation documented that the peak secondary side pressure did not exceed the design limit with the MSSV with the lowest lift setpoint inoperable on each loop. PG&E concluded that since operation at 100 percent RTP was confirmed to be acceptable with one inoperable MSSV, this established a conservatively bounding 13 percent margin to the existing PR high flux trip setpoint of 87 percent, which remained acceptable. The NRC reviewed and accepted these revisions to TS 3.7.1.1, Table 3.7-1 and the associated bases for the PR high flux trip setpoint in the NRC issuance of License Amendments (LAs) 125 and 123 for Unit 1 and Unit 2, respectively dated May 28, 1998 (Reference 4).

In August 2009, during Unit 2 Cycle 15 operation, MSSV RV-224 was declared inoperable. As a result, Unit 2 power was decreased to below 87 percent RTP and the PR high flux trip setpoint was then reduced to 87 percent RTP as specified in TS Table 3.7.1-1. Since it was not feasible to repair or replace the MSSV until the upcoming refueling outage, PG&E began preparing an emergency LAR to justify operation at 100 percent RTP for the remaining weeks of Unit 2 Cycle 15 based on the PG&E Calculation N-114 RETRAN-02 LOL/TT analysis results. During the performance of supporting RETRAN-02 sensitivity studies for Unit 2 Cycle 15 in coordination with Westinghouse, PG&E identified a nonconforming condition in that the single FSARU case evaluated in N-114, which assumed 102 percent RTP and a +5 pcm/F MTC, was not necessarily bounding for all reduced power conditions associated with an inoperable MSSV. With a +5 pcm/F MTC, the increasing Tavg following a LOL/TT event causes a rapid reactor power and RCS pressure increase that results in a high pressurizer pressure trip. However, the RETRAN-02 sensitivity studies determined that for LOL/TT cases from a reduced power of 90 percent RTP and a 0 pcm/F MTC, the RCS Tavg increase does not cause the same corresponding reactor power increase. This effect delays the net pressurizer pressure increase and the time at which the pressurizer pressure trip setpoint is reached. This delayed trip time can result in the total integrated energy transferred into the RCS exceeding the reduced relief capacity associated with only four out of the five MSSVs operable.

In response to the nonconforming condition, PG&E performed a Prompt Operability Assessment (POA). The POA concluded that Unit 1 and Unit 2 remained operable and the PR high flux trip setpoint of 87 percent RTP specified in TS Table 3.7.1-1 remained acceptable based on additional RETRAN-02 analysis results that credited better estimate as-found MSSV setpoint tolerance data. PG&E then completed Calculation STA-279 (Reference 10) to demonstrate that Unit 2 could acceptably operate at 100 percent RTP for the remainder of Cycle 15 with MSSV RV-224 inoperable. PG&E Calculation STA-279 documented RETRAN-02 LOL/TT analyses demonstrating that the large negative MTC conditions near end of core life results in a significant power decrease and much less limiting peak pressure results following a LOL/TT heatup event.

PG&E submitted the Emergency LAR 09-04 in letter DCL-09-62 dated September 3, 2009 (Reference 5), with the PG&E Calculation STA-279 RETRAN-02 analysis results as the basis for requesting a one time exception note to Table 3.7.1-1 to allow a PR high flux trip setpoint of 106 percent RTP for the remainder of Unit 2 Cycle 15 with MSSV RV-224 inoperable in order to allow operation at 100 percent RTP. The NRC reviewed and accepted this revision to TS 3.7.1, Table 3.7.1-1 and the associated bases for the PR high flux trip setpoint in the NRC issuance of Unit 2 LA 208 dated September 17, 2009 (Reference 6).

This LAR does not request a change to the TS Table 3.7.1-1 PR neutron high flux trip setpoint of 87 percent. In PG&E Letter DCL-07-002, "License Amendment Request 07-01, Revision to Technical Specifications to Support Steam Generator Replacement," dated January 11, 2007 (Reference 11), PG&E made a commitment to the NRC regarding the setpoint methodology. PG&E commited to submit changes related to the setpoint methodology to the NRC once the Technical Specification Task Force (TSTF) -493, "Clarify Application of Setpoint Methodology for LSSS Functions," is approved by the NRC. The NRC has since published the Notice of Availability for TSTF-493, Revision 4, on May 11, 2010. Therefore, any required changes to TS Table 3.7.1-1 to address application of the setpoint methodology will be addressed separately in the future LAR for TSTF-493.

Purpose for Proposed Amendment

The proposed amendment removes a one time note listed in TS Table 3.7.1-1 specific to Unit 2 Cycle 15 that is no longer applicable or needed. This LAR also would revise the TS Bases B 3.7.1 to reflect a new analysis methodology for establishing the reduced PR neutron flux high setpoint for one inoperable MSSV as listed in Table 3.7.1-1. No changes to the PR neutron flux high setpoint are proposed; the value of 87 percent RTP listed in TS Table 3.7.1-1 for one inoperable MSSV will remain.

As described in the background section, during the development of the emergency LAR 09-04, submitted in PG&E Letter DCL-09-062, dated September 3, 2009, a nonconforming condition was identified in the older analyses, which was submitted to the NRC via PG&E Letter DCL-97-105, "LAR 97-06: Revision of Technical Specification 3.7.1.1, Table 3.7-1 and Associated Bases - Reduced Power Operation Levels for Inoperable MSSVs," dated December 23, 1997. Based on PG&E calculations, the 1997 analysis assumptions were determined to not be conservatively bounding in all cases. In response to this condition, a specific LOL/TT analysis crediting the negative MTC for Unit 2 Cycle 15 was incorporated into LAR 09-04 to demonstrate the acceptability of full power operation for the remainder of the cycle with one inoperable MSSV. To permanently resolve the nonconforming condition, a new LOL analysis has been performed to demonstrate acceptability over the full range of the operating cycle MTC conditions. Therefore, this LAR will revise TS Bases B 3.7.1 to reflect a new conservative analysis methodology that resolves this nonconforming condition and re-establishes the basis for the TS setpoint in TS Table 3.7.1-1. The analysis demonstrates that the existing reduced PR neutron flux high setpoint associated with one inoperable MSSV is acceptable. Currently, TS Table 3.7.1-1 lists the setpoint associated with one inoperable MSSV as 87 percent RTP; this value has been reviewed and found acceptable.

3. TECHNICAL EVALUATION

System Design Basis

The design basis of the MSSVs is to limit secondary system pressure to less than or equal to 110 percent of the design pressure for any anticipated operational occurrence (AOO) or analyzed design basis accident (DBA) or transient analyses.

The events that challenge the relieving capacity of the MSSVs, and thus RCS pressure, are those events characterized as decreased heat removal events, presented in FSARU, Sections 15.2 and 15.3. Of these, the full power LOL/TT without steam dump is the limiting AOO with respect to the secondary system pressure. The analysis of this event also assumes termination of normal feedwater flow to the SGs.

The safety analysis demonstrates that the transient response for turbine trip occurring from full power without a direct reactor trip presents no hazard to the integrity of the RCS or the main steam supply system (MSSS).

The LOL/TT analysis presented in the DCPP FSARU Section 15.2.7 addresses the criteria of minimum departure from nucleate boiling ratio (DNBR), RCS overpressurization, and MSS overpressurization. The FSARU analysis cases assume that all five MSSVs are operable, and are not affected by this special analysis for TS 3.7.1 with one MSSV inoperable.

Safety Analyses With One MSSV Inoperable

The current LOL/TT analysis for one inoperable MSSV (Reference 10) uses the same PG&E RETRAN-02 model that was used for the LOL/TT analysis in FSARU Section 15.2.7, and was approved for use by the NRC. PG&E adhered to all limitations in using the RETRAN-02 code as required by and documented in the NRC Safety Evaluation Report for WCAP-14882-P-A (Reference 7).

In order to resolve the nonconforming condition associated with the TS Bases B 3.7.1, Westinghouse performed a spectrum of LOL/TT analysis cases with one inoperable MSSV per steam lead to ensure that the corresponding PR neutron flux high setpoint of 87 percent listed in TS Table 3.7.1-1 remains conservatively bounding. This nonconforming condition only involves the specific cases evaluated for one inoperable MSSV per steam lead. The existing FSARU LOL/TT cases evaluated for overpressure and DNBR were determined to remain conservatively bounding.

The new Westinghouse analyses used the Westinghouse RETRAN-02W computer code to evaluate the LOL/TT cases in support of this LAR.

The RETRAN-02W code is documented in WCAP-14882-P-A and was accepted by the NRC for analysis of several non-LOCA accidents including the LOL/TT event. As part of a recent Steam Generator Replacement Project (SGRP) at DCPP, PG&E incorporated the RETRAN-02W non-LOCA accident analysis methodology into the plant licensing basis (per 10 CFR 50.59 and NEI 96-07 guidance, crediting the applicable NRC Safety Evaluation Report (SER) for the R. E. Ginna Nuclear Power Plant)(Reference 8).

The new Westinghouse analyses use the RETRAN-02W models developed for the DCPP Unit 1 and 2 SGRP. These RETRAN-02W models incorporate the input assumptions and protection setpoints summarized in Tables 1 and 2 to ensure that the LOL/TT cases are appropriately conservative relative to evaluating the maximum main steam system (MSS) peak pressure. Westinghouse evaluated a range of reduced power and MTC conditions, which credit the Over Temperature Delta Temperature (OTDT) reactor trip function to establish a conservative, bounding PR neutron flux high setpoint listed in TS Table 3.7.1-1.

Five LOL/TT cases were examined for DCPP Unit 1 and Unit 2. The first LOL/TT case was prepared as a benchmark case. It ensures that the Westinghouse RETRAN-02W model provides comparable results to the PG&E RETRAN-02 results for the design basis full power LOL/TT case with all five MSSVs operable as reported in the FSARU 15.2.7.

The four remaining LOL/TT cases assume only four operable MSSVs per lead and assume that the MSSV with the lowest opening setpoint is inoperable. These inoperable MSSV cases were examined with varying power levels and MTC values to ensure that the conditions associated with the TS limits are bounded as summarized below:

- 102 percent RTP with a zero MTC, consistent with the full power limit
- 102 percent RTP with a positive MTC consistent with the limit at 87 percent RTP (+2.2 pcm/°F),
- 87 percent RTP with a positive MTC consistent with the limit at 87 percent RTP (+2.2 pcm/°F), and
- 87 percent RTP with a positive MTC consistent with the limit for less than or equal to 70 percent RTP (+5.0 pcm/°F).

It was determined that Unit 2, with a slightly higher design RCS Tavg than Unit 1, generated more limiting peak pressure results and only the Unit 2 results are presented. The key analysis input parameters and assumptions for the limiting Unit 2 analysis are summarized in Table 1.

The analysis credits the OTDT reactor trip protection function consistent with that shown in FSARU Figure 15.1-1 and as summarized in Table 2. Conservatively, the automatic turbine runback control feature for the OTDT function is not credited in these LOL/TT cases. To conservatively avoid an early reactor trip, the pressurizer power operated relief valves (PORVs) are assumed to be operable with an elevated relief flow capacity that precludes RCS pressure from reaching the high pressurizer pressure reactor trip. This ensures that these cases bound the nonconforming condition described.

Table 1: Unit 2 Input Parameters and Assumptions

Parameter	Value
Initial Conditions	
Nuclear Steam Supply System (NSSS) Power	3425 MWt RTP
Reactor Coolant Flow (Thermal Design Flow)	354,000 gpm
Vessel Average Temperature (Tavg) Program	547°F (0% RTP) to 577.6°F (100% RTP)
Pressurizer Pressure	2250 psia
Pressurizer Level Program	22.3% span (at 547°F) to 61.1% span (at 577.6°F)
Steam Generator Level	65% narrow range span (NRS)
Main Feedwater (MFW) Temperature	435°F
SG Tube Plugging (SGTP) Level	0% (with zero tube fouling factor)
Initial Condition Uncertainties	
NSSS Power Uncertainty	+2% RTP (full-power cases only)
Tavg Uncertainty	+5°F
RCS Pressure Uncertainty	-60 psi
Pressurizer Level Uncertainty	+5.7% span
Reactivity Feedback Coefficients	Minimum feedback
MTC	Varies by case (see Table 3)
Doppler-only Power Coefficient	Least negative (FSARU Fig. 15.1-5 lower)
Delayed Neutron Fraction (β_{eff})	0.007337 (maximum)
Reactor Trip Function / Delay Time	OTDT (see Table 2) 2.0 seconds
Trip Reactivity	4.0% $\Delta k/k$
Main Steam Safety Valves	
Nominal TS Lift Setpoints	1065, 1078, 1090, 1103, 1115 psig
Lift Setpoints Tolerance	+3%
Accumulation	5 psi
Pressurizer Assumptions	
Pressurizer Power Operated Relief Valves	Operable
Pressurizer Sprays	Operable

Table 2: Over Temperature Delta Temperature Reactor Trip Setpoint Parameters

The analysis assumes an OTDT reactor trip consistent with the illustration of DCPP FSARU Figure 15.1-1. The setpoint constants listed below (for Unit 2) are the same as in TS Table 3.3.1-1, except for the K_1 constant, where the safety analysis limit (SAL) value is used. The SAL K_1 value of 1.32 calculates a larger OTDT trip setpoint which conservatively bounds the K_1 value of 1.2 listed in TS Table 3.3.1-1.

ΔT_o = 64.56°F
T′ = 577.6°F
K_1 = 1.32 (SAL)
K_2 = 0.0182 /°F
K_3 = 0.000831 /psi
f(ΔI) - not used
τ_1 = 30 seconds
τ_2 = 4 seconds
τ_4 = 0 seconds
τ_5 = 0 seconds

Table 3: Summary of Unit 2 Results

Case	NSSS Power (% RTP)	Operable MSSVs	MTC (pcm/°F)	Reactor Trip	Time of Trip (sec)	Time of Rod Motion (sec)	Peak Nuclear Power (% RTP)	Peak MSS Press (psia)
1	102	5	0.0	OTDT	8.89	10.89	102.6	1193.82
2	102	4	0.0	OTDT	8.90	10.90	102.6	1205.36
3	102	4	+2.2	OTDT	8.87	10.87	105.6	1205.79
4	87	4	+2.2	OTDT	12.37	14.37	92.5	1201.49
5	87	4	+5.0	OTDT	12.33	14.33	97.5	1202.22

In the analysis, a 3 percent tolerance was assumed for all the available MSSVs. The MSSV on each SG with the lowest nominal setpoint was assumed unavailable, and the Unit 2 model is used because of its higher design RCS average temperature. The results of the calculation show that the peak pressures in the SGs are lower than 1210 psia, or 110 percent of the 1085 psig SG design pressure.

Thus, with one MSSV inoperable per SG, the remaining MSSVs are capable of providing sufficient pressure relief capacity for the plant to operate at 100 percent RTP. However, the value applied to the high neutron flux trip setpoints must be lowered an additional 6 percent RTP to account for instrument and channel uncertainties. This adjustment for uncertainties results in a permissible setpoint of 94 percent RTP; however, the setpoint will remain at 87 percent RTP for additional conservatism.

Table 4: Time Sequence of Unit 2 Events

Event	Case 3 Time (sec)	Case 4 Time (sec)
LOL/TT, MSIV and MFIV Closure	0.0	0.0
Non-safety related Pressurizer PORV Opens (1)	3.61	4.00
Two Safety related Pressurizer PORVs (1)	5.53	6.13
1st MSSV Bank Opens (Inoperable)	N/A	N/A
2nd MSSV Bank Opens	6.25	7.32
3rd MSSV Bank Opens	7.04	8.41
OTDT Reactor Trip Setpoint Reached	8.87	12.37
4th MSSV Bank Opens	9.66	11.33
Rod Insertion Begins	10.87	14.37
5th MSSV Bank Opens	12.07	16.00
Peak MSS Pressure Reached	15.75	19.16
Maximum MSSV Bank 5 Flow Attained	15.94	19.44

(1) – DCPP has one nonsafety-related pressurizer PORV that opens on the Class 2 compensated control system pressure signal and two safety-related PORVs that open directly on the Class 1 pressure signal that feeds reactor protection.

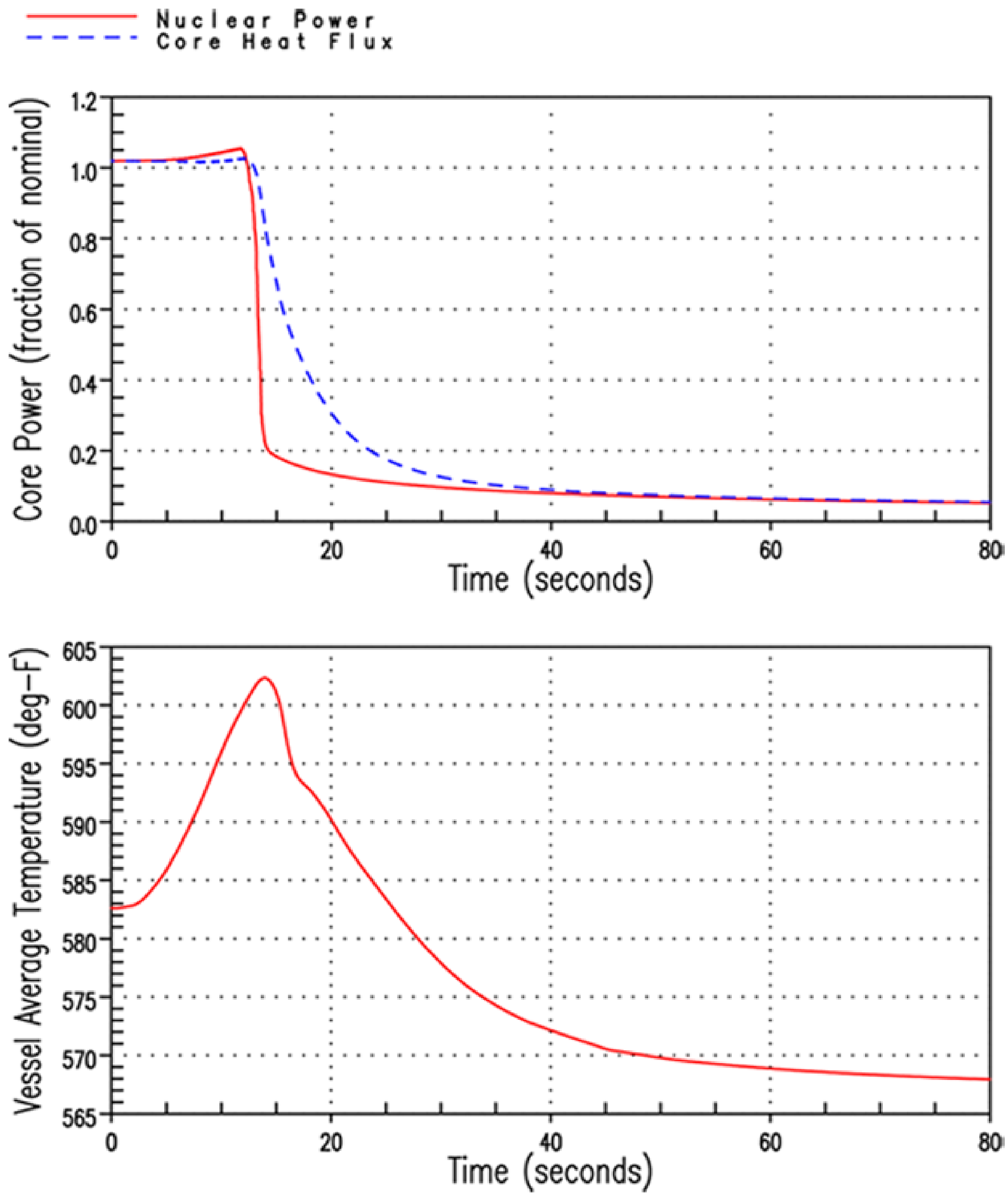

Figure 1

DCPP Unit 2 LOL/TT with One Inoperable MSSV – 102 percent RTP, MTC = +2.2 pcm/°F

Core Power and Vessel Average Temperature Transients

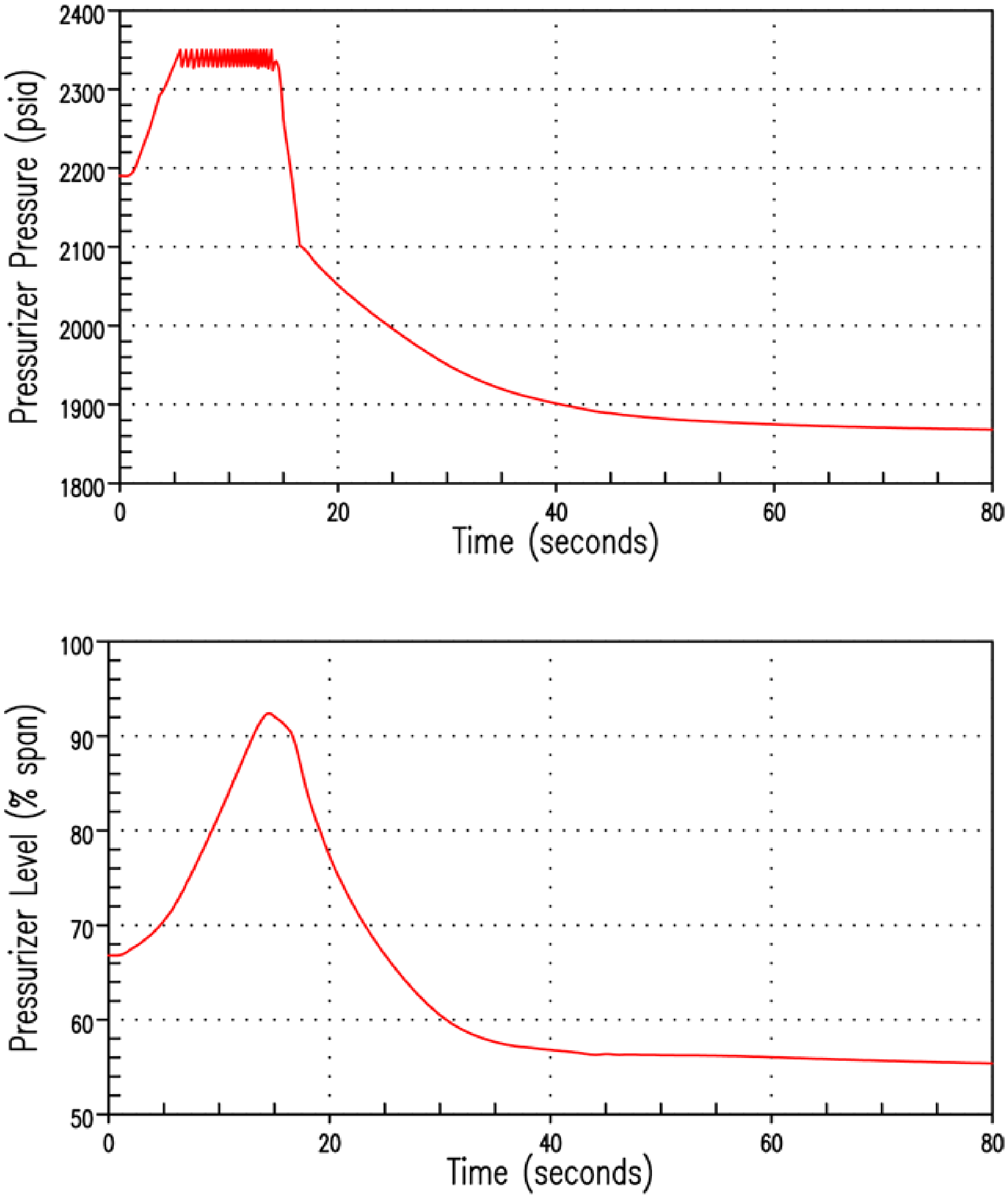

Figure 2

DCPP Unit 2 LOL/TT with One Inoperable MSSV – 102 percent RTP, MTC = +2.2 pcm/°F

Pressurizer Pressure and Level transients

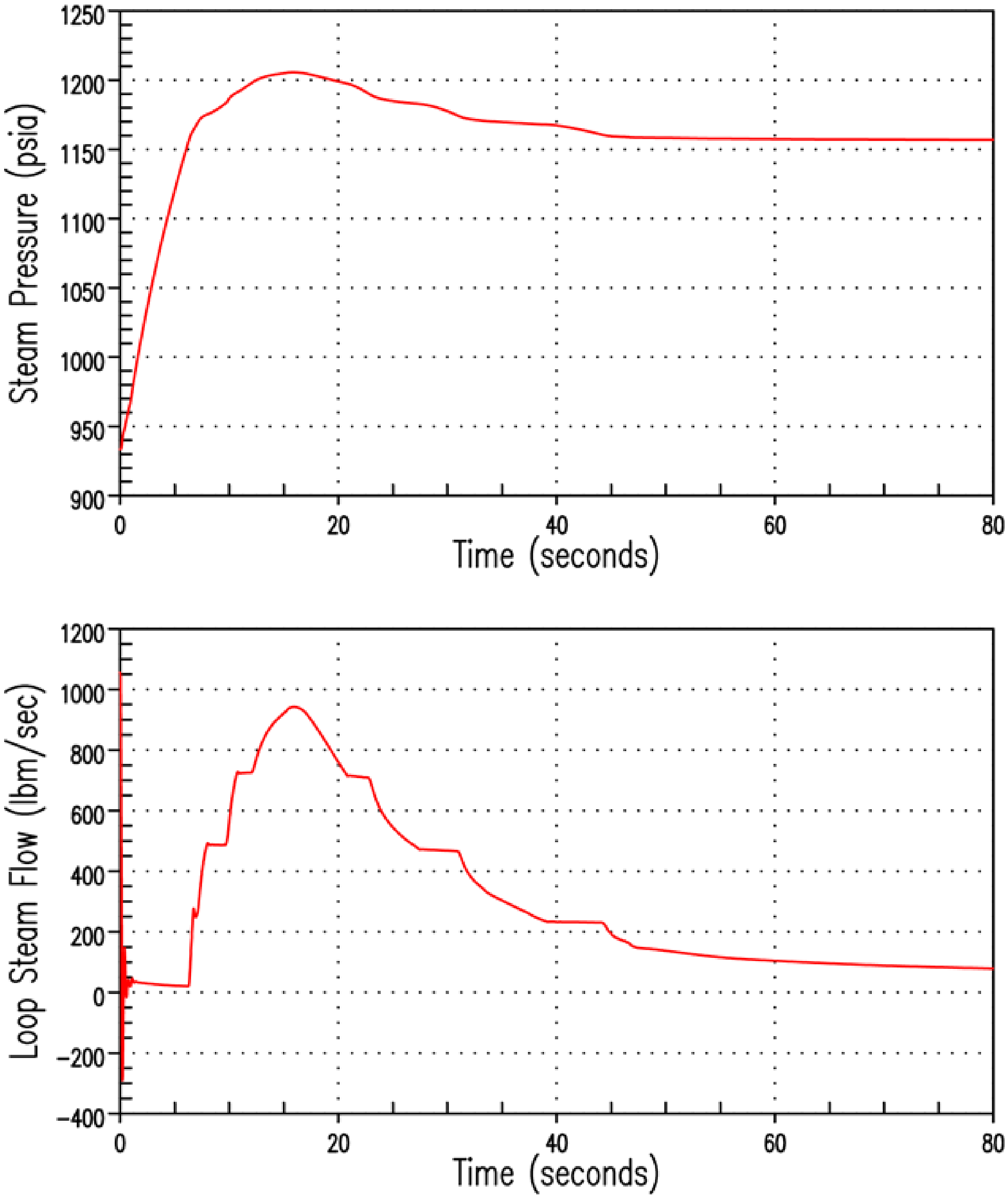

Figure 3

DCPP Unit 2 LOL/TT with One Inoperable MSSV – 102 percent RTP, MTC = +2.2 pcm /°F

Steam Pressure and Loop Steam Flow Transients

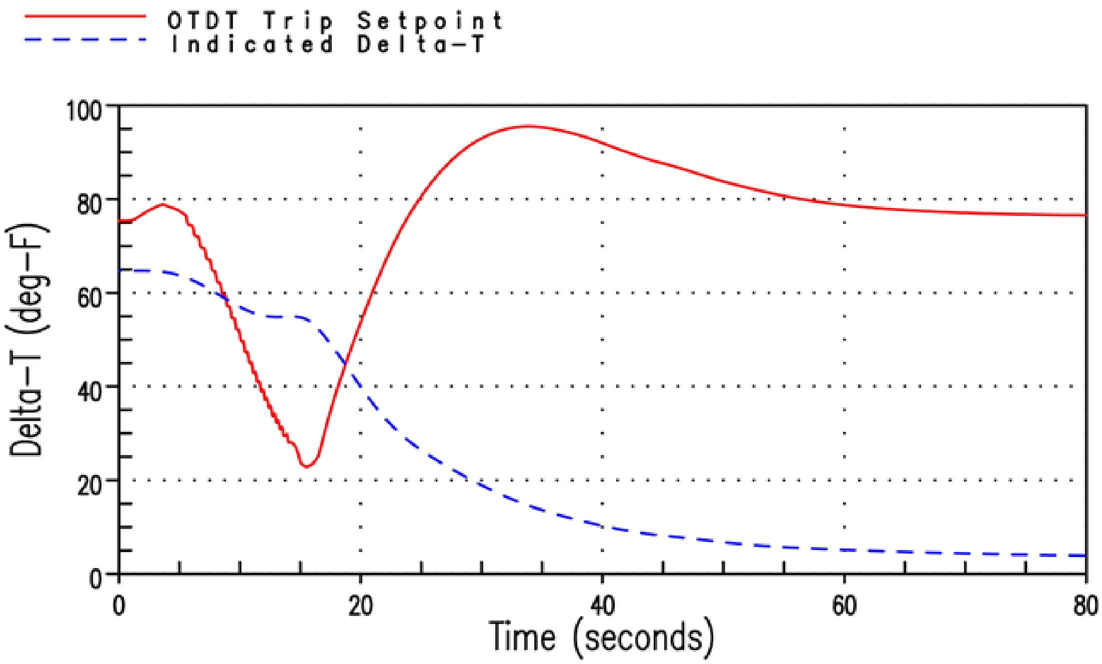

Figure 4

DCPP Unit 2 LOL/TT with One Inoperable MSSV – 102 percent RTP, MTC = +2.2 pcm /°F

OTDT Trip Setpoint and Indicated Delta-T Transients

Acceptance Criterion

The LOL/TT analysis acceptance criterion is to demonstrate that the peak MSS pressure does not exceed 110 percent of the 1085 psig SG design pressure or a limit of 1210 psia as described in the TS B 3.7.1.

Results and Conclusion

The Unit 2 LOL/TT results summarized in Table 3 demonstrate that in all cases the MSS overpressure acceptance criterion of 1210 psia is met.

The most limiting pressure calculated is for Case 3, which is evaluated at 102 percent RTP and an assumed MTC of +2.2 pcm/°F. The time sequence of events for Case 3 is presented in Table 4.

Figures 1 through 4 present the transient results for key RCS and secondary parameters of interest. The time sequence of events for Case 4 is also presented in Table 4 since this case evaluates the thermal power (87 percent RTP) and MTC (+2.2 pcm/°F) values that are consistent with the applicable TS 3.7.1 limits.

TS Bases Changes

The TS Bases are updated to reflect the revised analysis for one inoperable MSSV.

System Summary/Conclusion

These LOL/TT results confirm that the main steam system overpressure design basis is met and bounded by the current maximum TS Table 3.7.1-1 setpoint of 87 percent RTP for one inoperable MSSV per SG. The current TS 3.7.1 limiting condition for operation remains valid.

4. REGULATORY ANALYSIS

4.1 Applicable Regulatory Requirements/Criteria

The ASME Boiler and Pressure Vessel Code, Section III, provides the design basis for the MSSVs and limits the secondary system pressure to less than or equal to 110 percent of design pressure for any anticipated operational occurrence or accident considered in the Design Basis Accident and Transient Analysis. The MSSVs satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

With the TS and TS Bases changes identified in this LAR, the MSSVs will continue to limit the secondary system pressure to less than or equal to 110 percent of the secondary side design pressure for any AOO or accident considered in the Design Basis Accident or Transient Analysis and the MSSVs continue to satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

As no structure, system, or component function is affected and as there is no operation or setpoint change, there is no change to the probability of LOL/TT events or other previously evaluated accidents.

Since the new analysis confirmed the MSS pressure limits would be met using the TS Table 3.7.1-1 Power Range Neutron Flux Reactor Trip values for 1 MSSV inoperable, there is no change to the event results and no change to the event consequences.

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

4.2 Precedent

The July 11, 2006 R.E. Ginna Nuclear Power Plant Amendment Safety Evaluation for a power uprate approved the use of RETRAN-02 and the OTDT trip for LOL analysis per Reference 8.

4.3 No Significant Hazards Consideration Determination

PG&E has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1. *Does the change involve a significant increase in the probability or consequences of an accident previously evaluated?*

This License Amendment Request (LAR) proposes to remove a one-time Unit 2 Cycle 15 Limiting Condition for Operation (LCO) exemption that is no longer applicable and revise the safety analysis performed in support of Technical Specification (TS) 3.7.1, "Main Steam Safety Valves (MSSVs)," Table 3.7.1-1, "Maximum Allowable Power Range Neutron Flux High

Setpoint With Inoperable MSSVs" for one inoperable MSSV. The revised safety analysis resolves a nonconforming condition associated with the TS 3.7.1 Bases and re-establishes that the Power Range Neutron Flux High setpoint of 87 percent Rated Thermal Power (RTP) continues to provide adequate protection for one inoperable MSSV on each steam lead.

The Power Range Neutron Flux High setpoint TS value does not initiate an accident. Technician adjustments to lower the Power Range Neutron Flux High setpoint could cause a reactor trip; however, this action is already a TS requirement. There has been no change in the TS setpoint value from the current value or in the requirement for a technician to adjust the setpoints downward when MSSVs become inoperable. Therefore, this proposed change will not increase the probability of a reactor trip.

The revised TS B 3.7.1 safety analyses establishes that the current Power Range Neutron Flux High setpoint of 87 percent with one inoperable MSSV on each loop will ensure the remaining MSSVs will continue to prevent overpressure of the main steam leads and steam generators, and remove adequate heat from the RCS.

Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. *Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?*

The revised safety analysis which credits the Class 1 Over Temperature Delta Temperature (OTDT) reactor trip and the Power Range Neutron Flux High setpoint TS value with one inoperable MSSV do not initiate an accident and do not change the method by which any safety-related system performs its function.

The proposed change does not result in plant operation outside the limits previously considered, nor allow the progression of transients or accidents in a manner different than previously considered.

Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. *Does the change involve a significant reduction in a margin of safety?*

The proposed change and revised safety analysis demonstrate that all applicable Reactor Coolant System (RCS) and steam generator (SG) pressure boundary acceptance criteria are satisfied, and re-establish that the existing Power Range Neutron Flux High setpoint TS value for one inoperable MSSV remains conservatively bounding. Therefore, the proposed change does not involve a reduction in a margin of safety.

With the proposed change, the MSSVs will prevent SG pressure from exceeding 110 percent of SG design pressure in accordance with the American Society of Mechanical Engineers code. The conclusions for the Final Safety Analysis Report accident analyses are unaffected by the change, remain valid, and provide margin.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above safety evaluation, PG&E concludes that the change proposed by this LAR satisfies the no significant hazards consideration standards of 10 CFR 50.92(c), and accordingly a no significant hazards finding is justified.

4.4 Conclusions

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

5. ENVIRONMENTAL CONSIDERATION

PG&E has evaluated the proposed amendment and has determined that the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6. REFERENCES

1. NRC Information Notice 94-60 "Potential Overpressurization of Main Steam System," August 22, 1994.
2. PG&E Letter DCL-97-105, "License Amendment Request 97-06 Revision of Technical Specification 3.7.1.1, Table 3.7-1 and Associated Bases - Reduced Power Operation Levels for Inoperable Main Steam Safety Valves (MSSVs)," December 23, 1997.
3. Westinghouse Nuclear Safety Advisory Letter NSAL-94-001, "Operation at Reduced Power Levels with Inoperable MSSVs," January 20, 1994 (included in NRC Information Notice IN-94-60, "Potential Overpressurization of the Main Steam System," August 22, 1994.
4. NRC Letter, "Issuance of Amendments for Diablo Canyon Nuclear Power Plant, Unit No. 1 (TAC NO. MA0397) and Unit No. 2 (TAC NO. MA0398)," May 28, 1998.
5. PG&E Letter DCL-09-062, "Emergency License Amendment Request 09-04 Revision to Technical Specification 3.7.1, 'Main Steam Safety Valves (MSSVs) for Unit 2 Cycle 15,'" September 3, 2009.
6. NRC Letter, "Diablo Canyon Power Plant, Unit No.2, Issuance of Exigent Amendment Re: Request for One-Time Change to Technical Specification (TS) 3.7.1, 'Main Steam Safety Valves (MSSVs),' Table 3.7.1-1, 'Maximum Allowable Power Range Neutron Flux High Setpoint with Inoperable MSSVs' (TAC NO. Me2176)," September 17, 2009.
7. WCAP-14882-P-A, "RETRAN-02W Modeling and Qualification for Westinghouse Pressurized Water Reactor Non-LOCA Safety Analyses," April 1999.
8. R. E. Ginna Nuclear Power Plant, Docket No. 50-244, letter from Patrick D. Milano (NRC) to Mrs. Mary G. Korsnick, "R. E. Ginna Nuclear Power Plant-Amendment Re: 16.8 Percent Power Uprate (TAC No. MC7382)," July 11, 2006.
9. PG&E Calculation N-114, Rev. 0, March 10, 1994.
10. PG&E Calculation STA-279, Rev. 0, September 3, 2009.
11. PG&E Letter DCL-07-002, "License Amendment Request 07-01, Revision to Technical Specifications to Support Steam Generator Replacement," January 11, 2007.

Proposed Technical Specification Changes (marked-up)

Table 3.7.1-1 (page 1 of 1)
Maximum Allowable Power Range Neutron Flux High Setpoint With Inoperable MSSVs

MINIMUM NUMBER OF MSSVs PER STEAM GENERATOR REQUIRED OPERABLE	MAXIMUM ALLOWABLE POWER RANGE NEUTRON FLUX HIGH SETPOINT %RTP
4	87* ~~**~~
3	47*
2	29*

* Unless the reactor trip system breakers are in the open position.

~~** For Unit 2 Cycle 15 with only MS-2-RV-224 inoperable, a Maximum Allowable Power Range Neutron Flux High Setpoint of 106% RTP may be used. If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service. The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Nominal Trip Setpoint (NTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the NTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance. The methodologies used to determine the as-found and the as-left tolerances are specified in the Equipment Control Guidelines.~~

Proposed Technical Specification Changes (retyped)

Table 3.7.1-1 (page 1 of 1)
Maximum Allowable Power Range Neutron Flux High Setpoint With Inoperable MSSVs

MINIMUM NUMBER OF MSSVs PER STEAM GENERATOR REQUIRED OPERABLE	MAXIMUM ALLOWABLE POWER RANGE NEUTRON FLUX HIGH SETPOINT %RTP
4	87*
3	47*
2	29*

* Unless the reactor trip system breakers are in the open position.

Changes to Technical Specification Bases Pages
(For information only)

B 3.7 PLANT SYSTEMS

B 3.7.1 Main Steam Safety Valves (MSSVs)

BASES

BACKGROUND

The primary purpose of the MSSVs is to provide overpressure protection for the secondary system. The MSSVs also provide protection against overpressurizing the reactor coolant pressure boundary (RCPB) by providing a heat sink for the removal of energy from the Reactor Coolant System (RCS) if the preferred heat sink, provided by the Condenser and Circulating Water System, is not available.

Five MSSVs are located on each main steam header, outside containment, upstream of the main steam isolation valves, as described in the FSAR, Section 10.3.1 (Ref. 1). The MSSVs must have sufficient capacity to limit the secondary system pressure to ≤ 110% of the steam generator design pressure. The MSSV design includes staggered setpoints, according to Table 3.7.1-2 in the accompanying LCO, so that only the needed valves will actuate. Staggered setpoints reduce the potential for valve chattering that is due to steam pressure insufficient to fully open all valves during an overpressure event.

APPLICABLE SAFETY ANALYSES

The design basis for the MSSVs comes from Reference 2 and its purpose is to limit the secondary system pressure to ≤ 110% of design pressure for any anticipated operational occurrence (AOO) or accident considered in the Design Basis Accident (DBA) and transient analysis.

The events that challenge the relieving capacity of the MSSVs, and thus RCS pressure, are those characterized as decreased heat removal events, which are presented in the FSAR, Section 15.2 and 15.3 (Ref. 3). Of these, the full power turbine trip without steam dump is the limiting AOO with respect to secondary system pressure. This event also terminates normal feedwater flow to the steam generators.

The safety analysis demonstrates that the transient response for turbine trip occurring from full power without a direct reactor trip presents no hazard to the integrity of the RCS or the Main Steam System.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)	One turbine trip analysis is performed assuming primary system pressure control via operation of the pressurizer relief valves and sprays. The analysis demonstrates that the DNB design basis is met. Another analysis is performed assuming no primary system pressure control, but crediting reactor trip on high pressurizer pressure and operation of the pressurizer safety valves. This analysis demonstrates that the maximum RCS pressure does not exceed 110% of the design pressure. All cases analyzed demonstrate that the MSSVs maintain Main Steam System integrity by limiting the maximum steam pressure to less than 110% of the steam generator design pressure. The MSSVs are assumed to have two active and one passive failure modes. The active failure modes are spurious opening, and failure to reclose once opened. The passive failure mode is failure to open upon demand. The MSSVs satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).
LCO	The accident analysis requires that five MSSVs per steam generator be OPERABLE to provide overpressure protection for design basis transients occurring at 102% RTP. The LCO requires that five MSSVs per steam generator be OPERABLE in compliance with Reference 2. The OPERABILITY of the MSSVs is defined as the ability to open upon demand within the setpoint tolerances, to relieve steam generator overpressure, and reseat when pressure has been reduced. The OPERABILITY of the MSSVs is verified by periodic surveillance testing in accordance with the Inservice Testing Program. This LCO provides assurance that the MSSVs will perform their designed safety functions to mitigate the consequences of accidents that could result in a challenge to the RCPB, or Main Steam System integrity.
APPLICABILITY	In MODES 1, 2, and 3, five MSSVs per steam generator are required to be OPERABLE to limit secondary pressure. In MODES 4 and 5, there are no credible transients requiring the MSSVs. The steam generators are not normally used for heat removal in MODES 5 and 6, and thus cannot be overpressurized; there is no requirement for the MSSVs to be OPERABLE in these MODES.

(continued)

BASES (continued)

ACTIONS

The ACTIONS table is modified by a Note indicating that separate Condition entry is allowed for each MSSV.

A.1

With one or more MSSVs inoperable, action must be taken so that the available MSSV relieving capacity meets Reference 2 requirements.

Continued operation with less than all five MSSVs OPERABLE for each steam generator is permissible, if THERMAL POWER is limited to the relief capacity of the remaining MSSVs. This is accomplished by restricting THERMAL POWER and the Power Range Neutron Flux trip setpoint so that the energy transfer to the most limiting steam generator is not greater than the available relief capacity in that steam generator.

The Reactor Trip Setpoint reductions applied in TS Table 3.7.1-1 are derived on the following bases:

One MSSV Inoperable

The limiting FSAR Condition II accident for overpressure concerns is a loss of external load/turbine trip (LOL/TT). The event is analyzed with the RETRAN-02 computer program to demonstrate the adequacy of the MSSVs to maintain the main steam system lower than 1210 psia, or 110% of the 1085 psig SG design pressure when crediting only the Pressurizer Pressure High reactor trip.

In a ~~PG&E~~Westinghouse calculation, the LOL/TT transient is reanalyzed with the comparable RETRAN-02W code to determine the effect of only four MSSVs per SG being available when crediting the Overtemperature ΔT trip. The analysis assumes a 3% tolerance for all the available MSSVs. The MSSV on each SG with the lowest nominal setpoint was assumed unavailable, and the Unit 2 results are reported ~~model is used~~ because it is slightly more limiting with a~~of its~~ higher design RCS average temperature. The results of the calculation show that the peak pressures in the SGs are lower than 1210 psia, or 110% of the 1085 psig SG design pressure for a range of power levels and moderator temperature coefficients that bound a a Power Range Neutron Flux trip setpoint of 87% RTP (Ref. 8).

Thus, with one MSSV inoperable per SG, the remaining MSSVs are capable of providing sufficient pressure relief capacity for the plant to operate at 100% RATED THERMAL POWER (RTP). However, the value applied to the high neutron flux trip setpoints must be lowered an additional 6% RTP to account for instrument and channel uncertainties (Ref. 7). This adjustment results in a setpoint of 94% RTP; however, the setpoint will remain at 87% RTP for additional conservatism.

~~This paragraph applies during Unit 2 Cycle 15 with only MS-2-RV-224 inoperable. For Unit 2 Cycle 15 with only MS-2-RV-224 inoperable, the required high neutron flux trip setpoint is 106% RTP to ensure the remaining MSSVs are capable of providing sufficient pressure relief capacity for plant operation at 100% RTP (Ref. 10). The high neutron~~

~~flux trip setpoint is calculated using the methodology in WCAP-11082 (Ref. 7). For Unit 2 Cycle 15 additional footnotes provide requirements when the as-found channel setpoint is outside its predefined as-found tolerance, for reset of the instrument channel setpoint, and for when setpoints more conservative than the Nominal Trip Setpoint are used.~~

(continued)

BASES

ACTIONS

A.1 (continued)

The additional footnotes ensure the guidance provided in Regulatory Issue Summary 2006-17 (Ref. 11) are met and that the methodologies used to determine the as-found and the as-left tolerances are specified in a procedure controlled under 10 CFR 50.59.

More than One MSSV Inoperable

For more than one MSSV on each loop inoperable, the following Westinghouse algorithm contained in NSAL 94-001 (Ref. 4) is used:

$$\text{Hi}\ \phi = (100/Q)\frac{(w_g h_{fg} N)}{K}$$

where:

Hi ϕ = Safety Analysis PR high neutron flux setpoint, percent

Q = Nominal NSSS power rating of the plant (including reactor coolant pump heat), MWt

K = Conversion factor, 947.82 (Btu/sec)/MWt

w_s = Minimum total steam flow rate capability of the operable MSSVs on any one SG at the highest MSSV opening pressure including tolerance and accumulation, as appropriate, in lb/sec. For example, if the maximum number of inoperable MSSVs per SG is three, then w_s should be a summation of the capacity of the operable MSSVs at the highest operable MSSV operating pressure, excluding the three highest capacity MSSVs.

h_{fg} = heat of vaporization for steam at the highest MSSV opening pressure including tolerance and accumulation, as appropriate, Btu/lbm

N = Number of loops in plant

For the case of two and three inoperable MSSVs per SG, the setpoints derived are 53% and 35% RTP, respectively. However, the values applied to the high neutron flux trip setpoints must be lowered an additional 6% RTP to account for instrument and channel uncertainties (Ref. 7), which results in setpoints of 47% and 29% RTP, respectively (Ref. 9).

When a MSSV(s) is inoperable, the power must be reduced in 4 hours to a value less than or equal to the value specified in table 3.7.1-1, corresponding to the number of OPERABLE MSSVs.

The Power Range Neutron Flux-high trip setpoint must also be reduced in 4 hours, to less than or equal to the value specified in Table 3.7.1-1, corresponding to the number of OPERABLE MSSVs.

(continued)

BASES

ACTIONS

A.1 (continued)

The allowed Completion Time is reasonable base on operating experience to complete the Required Actions in an orderly manner without challenging unit systems.

B.1 and B.2

If THERMAL POWER and Power Range Neutron Flux Trip are not reduced as required by Table 3.7.1-1 within the associated Completion Time, or if one or more steam generators have less than two MSSVs OPERABLE, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours, and in MODE 4 within 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.7.1.1

This SR verifies the OPERABILITY of the MSSVs by the verification of each MSSV lift setpoint in accordance with the Inservice Testing Program. The ASME Code, Section XI (Ref. 5), requires that safety and relief valve tests be performed in accordance with ASME OM Code Appendix I (Ref. 6). According to Reference 6, the following tests are required:

a. Visual examination;

b. Seat tightness determination;

c. Setpoint pressure determination (lift setting);

d. Compliance with owner's seat tightness criteria; and

e. Verification of the balancing device integrity on balanced valves.

The ASME OM Code requires that all valves be tested every 5 years, and a minimum of 20% of the valves be tested every 24 months. The ASME Code specifies the activities and frequencies necessary to satisfy the requirements. Table 3.7.1-2 allows a ± 3% setpoint (as-found lift point) tolerance on the valves for OPERABILITY (with the exception of the lowest set MSSV setpoint, which is (+3%/-2%); however, the valves are reset to ± 1% during the Surveillance to allow for drift. The lift settings, according to Table 3.7.1-2 in the accompanying LCO, correspond to ambient conditions of the valve at nominal operating temperature and pressure.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.1.1 (continued)

This SR is modified by a Note that allows entry into and operation in MODE 3 prior to performing the SR. The MSSVs may be either bench tested or tested in situ at hot conditions using an assist device to simulate lift pressure. If the MSSVs are not tested at hot conditions, the lift setting pressure shall be corrected to ambient conditions of the valve at operating temperature and pressure.

REFERENCES

1. FSAR, Section 10.3.1.
2. ASME Boiler and Pressure Vessel Code, Section III, 1968.
3. FSAR, Section 15.2 and 15.3.
4. Westinghouse Nuclear Safety Advisory Letter NSAL-94-001, "Operation at Reduced Power Levels with Inoperable MSSVs," January 20, 1994 (included in NRC Information Notice IN-94-60, "Potential Overpressurization of the Main Steam System," August 22, 1994.
5. ASME, Boiler and Pressure Vessel Code, Section XI.
6. ASME Code for Operation and Maintenance of Nuclear Power Plants, 2001 Edition including 2002 and 2003 Addenda.
7. Westinghouse Report WCAP-11082, "Westinghouse Setpoint Methodology for Protection Systems Diablo Canyon Units 1 and 2, 24 Month Fuel Cycle Program and Replacement Steam Generator Evaluation.".
8. Westinghouse Letter PGE-10-43, "Diablo Canyon Units 1 and 2 Loss of Load / Turbine Trip Analysis with One Inoperable MSSV per Steam Generator", September 2, 2010.
~~PG&E Design Calculation N-114, "Over-Pressure Study for One MSSV Per Loop Unavailable", dated 3/10/94.~~
9. PG&E Design Calculation N-115, "Reduced Power Levels for A Number of MSSVs Inoperable", dated 3/14/94.
10. ~~PG&E Design Calculation STA-279, Revision 0, "RETRAN Loss of Load With an Inoperable MSSV".~~
11. NRC Regulatory Issue Summary (RIS) 2006-17, "NRC Staff Position on the Requirements of 10 CFR 50.36, 'Technical Specifications,' Regarding Limiting Safety System Settings During Periodic Testing and Calibration of Instrument Channels," dated August 24, 2006.